August 4, 2004 F/PIC:PV:FLF
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CRUISE REPORT

VESSEL: *Oscar Elton Sette*
CRUISE Cruise 04-01 (OES-10) (Fig. 1)

PERIOD: 8-29 January 2004

AREA OF OPERATION: Johnston Atoll; Howland and Baker Islands (U.S. Phoenix Islands)

TYPE OF OPERATION: Personnel from the Coral Reef Ecosystem Division, Pacific Island Fisheries Science Center, National Marine Fisheries Service (NMFS), NOAA, conducted reef assessment/monitoring and mapping studies in waters surrounding Johnston Atoll and the U.S. Phoenix Islands.

ITINERARY:

8-11 January — Start of cruise. Embarked Ed DeMartini (fish), Alan Friedlander (fish), Jason Philibotte (fish), Greta Aeby (coral), Jim Maragos (coral), Scott Godwin (invertebrates), Peter Vroom (algae), Kim Page (algae), Joe Laughlin (towboard/fish), Brian Zgliczynski (towboard/fish), Molly Timmers (towboard/habitat), Jake Asher (towboard/habitat), Jamie Gove (moorings/tow), Kyle Hogrefe (moorings/tow), Jeremey Jones (moorings/tow), Christina Kistner (moorings/tow), John Rooney (QTC/TOAD/CTD), Beth Flint (Terrestrial), Chris Eggleston (Terrestrial) and June Firing (data management). Depart Snug Harbor at 0800 to transfer to fuel pier for fueling. Depart Honolulu at 1500 en route to Johnston Atoll to commence cruise. Terrestrial team conducted pelagic birding surveys during daylight hours.

12 January — Arrived at Johnston Atoll. Completed 6 tows: 2 on the SW forereef, 1 on the SW insular reef, and 3 on the S insular reef. Conducted 2 fish and benthic REA surveys in lagoonal areas north of Johnston Island. Deployed WTR and 2 STR buoys. Scouted location for SST. Completed 4 deepwater CTDs at corners of the atoll and 4 ADCP transects.

13 January — Continued work at Johnston Atoll. Completed 6 tows: 1 on the E insular reef, 1 on the SE insular reef, 1 on the S insular reef, and 3 in the N back reef/lagoon. Conducted 3 fish and benthic REA surveys in lagoonal areas northeast of Johnston Island. Deployed 2 STRs and completed 34 shallow

	water CTDs. Completed 4 deep water CTDs at corners of the atoll and 4 ADCP transects.
14 January	Continued work at Johnston Atoll. Completed 5 tows: 2 on the NW forereef, 1 on the W forereef, 1 N of Johnston Island, and 1 in the back reef/lagoon N of Johnston Island. Conducted 3 fish and benthic REA surveys southeast of Johnston Island. Deployed SST. Conducted TOAD ops, followed by a deepwater CTD and ADCP.
15 January	Continued work at Johnston Atoll. Completed 6 tows: 2 on the central E insular reef, 1 on the central insular reef, and 3 on the NW back reef/lagoon. Conducted 1 fish and 2 benthic REA surveys around Johnston Island. Mooring team divers practiced towing techniques. Conducted TOAD ops, followed by a deepwater CTD and ADCP.
16 January	Continued work at Johnston Atoll. Completed 4 tows: 1 on the SE insular reef, 1 on the S insular reef, 1 on the W forereef, and 1 on the S side of Johnston Island. Conducted 2 fish and benthic REA surveys around Johnston Island. Mooring team divers practiced towing techniques. Conducted TOAD ops.
17-20 January	Departed for Howland Island, U.S. Phoenix Islands. Terrestrial team conducted pelagic birding surveys during daylight hours.
21 January	Arrived at Howland Island. Completed 6 tows encircling Howland Island. Conducted 3 fish and benthic REA surveys at existing permanent transects along the west side of the island. Deployed SST and 3 STR buoys. Completed 16 shallow water CTDs. Completed 2 deep water CTDs, 4 ADCP transects, and 4 TOAD transects.
22 January	Continued work at Howland Island. Completed 3 tows on the north and south sides of Howland Island. Conducted 2 fish and coral REAs, and 1 algae REA. Benthic teams completed a 90-ft dive, and fish team collected fish for DNA analysis. Deployed 1 STR and 8 shallow water CTDs. Retrieved old SST buoy (deployed 2002) from beach. Completed 2 TOAD transects and 1 deepwater CTD. Transited to Baker Island and began ADCP transects.
23 January	Arrived at Baker Island. Completed 6 tows almost encircling Baker Island. Conducted 3 fish and benthic REA surveys at existing sites along the east and south shores. Retrieved and replaced ODP, deployed 1 STR, and conducted shallow water

	CTDs. Completed 2 deepwater CTDs and 1 TOAD transect. TOAD was snagged and lost.
24 January	Continued work at Baker Island. Completed 2 tows on Baker Island. Conducted 3 fish and benthic REA surveys at existing sites along the west shore. Deployed 3 STR buoys, and conducted shallow water CTDs. Completed 6 deep water CTDs and ADCP lines.
25-29 January	Departed for Tutuila, American Samoa. Terrestrial team conducted pelagic birding surveys during daylight hours.

CRUISE STATISTICS:

	Johnston Atoll	Howland Island	Baker Island
Towed Diver Habitat/Fish Surveys	27	9	8
Fish Rapid Ecological Assessments	12	5	6
Benthic Rapid Ecological Assessments	12	4	6
Wave and Tide Recorders (WTR) Deployed	1	0	0
Ocean Data Platforms (ODP) Retrieved and Replaced	0	0	1
SST buoys deployed	1	1	0
SST buoys retrieved	0	1	0
STR buoys deployed	4	4	4
SVP drifters deployed	1	0	0
TOAD drop camera surveys	9	6	1
Deepwater CTDs	10	4	8
Shallow water CTDs	34	24	35
SCUBA dives	177	81	81

Table 1: Cruise statistics for Johnston Atoll and the U.S. Phoenix Islands.

MISSIONS AND RESULTS:

A. Used established quantitative methods to estimate fish stock biomass and fish species richness, respectively, at representative stations to contribute to an initial baseline assessment (at Johnston Atoll) or initiate monitoring for temporal changes (Howland, Baker Islands). See Appendix A.

1. Totals of 12, 5, and 6 stations were (re)surveyed for fishes by the 3-diver Fish REA Team at Johnston Atoll and at Howland and Baker Islands, respectively. The most striking aspect of observations at Johnston were (1) the low (relative to the Hawaiian Archipelago) fish species diversity and (2) the relative scarcity of small juvenile (recent recruit) individuals. Both features probably reflect the extreme isolation of Johnston Island from other shallow-water reef habitats.

At Howland and Baker Islands, resurveying of select historical stations confirmed the continued presence of species-rich (over 200 species overall), high-standing biomass fish assemblages dominated by carangid (jack) and shark apex predators and extremely abundant moderate- to large-bodied benthic carnivores, primarily groupers and snappers. Fish assemblages continued to be overwhelmed numerically by large swarms of small-bodied plankton feeders (primarily anthiine basslets) concentrated at current-upwelled reef faces along the leeward sides of the islands.

B. Conducted surveys to document the species composition, abundance, percent cover, size distribution, and general health of the shallow water corals at Johnston Atoll and the U.S. Phoenix Islands.

1. Full REA surveys were conducted at 12 sites around Johnston Atoll. Mild bleaching of relatively few colonies was found at 8 out of 12 sites. Corals with signs of potential disease were observed at 11 of 12 sites. Incidence and abundance of potential coral disease appeared higher than has been observed in the NWHI. Types of syndromes/diseases include: plaque-like signs on *Acropora cytherea,* patchy necrosis (tissue loss) on *M. patula, M. capitata* and *M. incrassata,* ring syndrome was observed on *M. patula* and *M. capitata,* protuberant tumors were found on *M. patula* and abnormal growths were found on *M. patula*. There was very little predation (fish, snail, COT) found on corals.

   Eleven surveys were conducted in the Phoenix Line Islands: six at Baker Island and five at Howland Island. Reefs in both areas were in good condition with only mild bleaching observed and very few colonies with any signs of disease.

C. Used quantitative photoquadrat sampling method to collect species composition and baseline abundance data of reef algae at Johnston Atoll and the U.S. Phoenix Islands to compare with previously collected qualitative samples (Appendix C).

1. A total of 264 algal photoquadrats (with accompanying field-ranked species lists and voucher specimens) were sampled at 22 sites: 12 at Johnston Atoll, 6 at Howland Island, and 4 at Baker Island (Appendix C). Although turf algae and crustose coralline algal pavements were pervasive, macroalgal cover was low at all islands with most large species found in relatively protected areas between coral fingers. Six genera of green, 8 genera of red, and 2 genera of brown macroalgae were observed at the 3 islands. Red algal floras differed substantially between Johnston Atoll and the Phoenix Islands, with no red algal genera shared between the 2 geographic areas. However, green and brown algal floras were similar, with 6 of the 8 genera discovered being found at all islands sampled. Although not as diverse as red algal genera, green algal genera

(particularly species of *Halimeda*) composed the bulk of macroalgal biomass seen.

D. The non-coral marine invertebrate fauna of coral reefs represents a group of animals that are numerically dominant in their habitat and in some cases represent taxonomic groups that are only represented in the marine environment. This group of organisms is surveyed and monitored for the purpose of identifying changes to reef communities. This is accomplished through procedures that quantify a set of target organisms and which also gradually builds an inventory of species to document biodiversity. See Appendix D.

1. A total of 24 sites were surveyed; 12 at Johnston Atoll, 6 at Howland Island, and 6 at Baker Island. Specifically the total sampling units were as follows: 24 transects and 24 10X25 meter quadrats for Johnston Atoll, 12 transects and 12 10X25 meter quadrats for Howland Island, and 12 transects and 12 10X25 meter quadrats for Baker Island. Species data is preliminary at this point and involves non-coral species quantified from field observations, which represented 6 phyla. The phylum Cnidaria was represented by 5 species from the class Hydrozoa and 5 species from the class Anthozoa. Only a single species from the phylum Annelida was enumerated from the field observations, but many more species remain to be identified from field collections. A total of 181 species from the phylum Mollusca were identified and are composed of 135 species from the class Gastopoda and 46 species from the class Bivalvia. None of the species from the subphylum Crustacea are enumerated to date but they are represented by the orders Decapoda, Amphipoda, Tanaidacea, Isopoda, and Stomatopoda. A total of 17 species were enumerated from the phylum Echinodermata, which included 3 species from the class Asteroidea, 7 species from the class Echinoidea, 5 species from the class Holothuroidea and 2 species from the class Ophiuroidea. The subphylum Urochordata was represented by two species, both from the order Aplousobranchia. Continued efforts with specimens collected from the field will reveal additional phyla but will also increase the species compliment for the taxonomic groups already identified. The bulk of species were represented by the phyla Mollusca and Echinodermata.

E. Used benthic and fish towed-diver survey methods at Johnston Atoll and the U.S. Phoenix Islands to provide a general description of reef habitat, invertebrates, and reef fishes over a large spatial scale. The methods provided assessments and the foundation for monitoring large-scale disturbances and general distribution and abundance patterns of macroinvertebrates and reef fishes over 50 cm total length (Appendix E).

1. A total of 44 towed-diver surveys were conducted totaling approximately 91 km of habitat: 53 km from 27 tows at Johnston Atoll, 21 km from 9

tows at Howland Island, and 17 km from 8 tows at Baker Island. An initial baseline assessment of reef fish assemblages was conducted at Johnston Atoll with the most common fish (larger than 50 cm TL) observed being gray reef sharks (*Carcharhinus amblyrhynchos n=101*). Preliminary results from the surveys conducted at Howland and Baker Island yielded the twin spot snapper (*Lutjanus bohar*) as the most abundant fish (larger than 50 cm TL) with 870 observations made during the survey period.

Coral appearing pale to the benthic observer was low at all three locals; Johnston having the highest percentage at 1.16%. Coral habitat appearing white was only observed at Johnston Atoll with .23%. The benthic observer did not record any crown-of-thorns starfish (COTS), *Acanthaster planci*, at Howland or Baker. One hundred and eighty two COTS were observed at Johnston Atoll.

F. Conducted near and off-shore oceanographic surveys and deployed a variety of surface and subsurface oceanographic instruments at Johnston Atoll and the U.S. Phoenix Islands with the goal to quantify, assess, and gain a better understanding of the overall hydrographic environment near these islands. See Appendix F.

1. A total of 44 shallow and deep water conductivity, temperature and depth (CTD) casts were performed at Johnston Atoll. Preliminary results show a well mixed upper 50-100 meters on the perimeter with lagoonal casts showing increased stratification. These conditions are likely due to the presence of a large swell event during field operations resulting in deep mixing of the external reef while having little influence on the internal lagoon, which tends to be dominated by diurnal heating and cooling from solar radiation. A telemetered sea surface temperature buoy, 4 subsurface temperature recorders, and 1 wave recorder were also deployed at Johnston.

   Howland and Baker Islands are of oceanographic interest as they are geographically located in the middle of two major ocean currents, the Equatorial Undercurrent (EUC), and the South Equatorial Current (SEC). Due to this unique current regime, differences greater than 1 degree Celsius temperature has been measured from one side of the islands to the other. Preliminary results from deep and shallow water CTDs taken this year however do not show this trend. Temperatures were nearly homogenous surrounding both islands, with the exception of Baker which had 0.2 to 0.3 degree differences on the western side compared to surrounding waters. This trend is likely due to the occurrence of an extremely deep thermocline centered near 190 meters during field operations at both islands. In addition, a total of two telemetered sea surface temperature buoys, 1 ocean data platform and 8 subsurface temperature recorders were deployed.

G. Goals for night operations during OES0401 included deployments of the Towed Optical Assessment Device (TOAD) to videotape portions of the seafloor, as well as the collection of QTC (benthic acoustic signature) data, acoustic doppler current profiler (ADCP) transects, and conductivity, temperature and depth (CTD) casts (Appendix G).

1. The TOAD was deployed a total of 21 times during OES0401, and it successfully videotaped the seafloor for durations of approximately 15 minutes to over an hour each time. On both Howland and Baker Islands we observed deeper habitats, in the approximate depth range of 80-100 m, with complex vertical structure and surprisingly large concentrations of reef fish, sharks, rays, etc. that were more similar to what we would expect during daylight hours. Of particular interest, several Tinker's butterfly fish, *Chaetodon tinkeri* were observed over multiple tows. This species has never been recorded at these islands before, and these sightings represent a significant increase in the geographic range of these fish, previously reported only in the Hawaiian, Marshall, and Cook Islands. A total of 19 CTD casts were made despite problems of frozen bearing on the idler sprocket on the CTD winch which precluded operations for a time. Heading problems were encountered with the ADCP so it is unclear at this time how much of the 437 km of ADCP transect data collected during OES0401 will be recoverable.

H. The terrestrial team conducted pelagic bird and mammal transects during transit between islands. On shore, a standard rapid ecological assessment of the islands were made by counting and staging all active nests of breeding seabirds, counting wintering shorebirds, listing all plant species and recording their phenological condition, as well as looking for other biological phenomena and signs of trespass or introductions of non-native invasives. Appendix H.

SCIENTIFIC PERSONNEL:

Peter Vroom, PhD, Chief Scientist, Benthic Team – Algae, UH-JIMAR, PIFSC-CRED
Kimberly Page, Benthic Team – Algae, UH-JIMAR, PIFSC-CRED
Scott Godwin, Benthic Team – Invertebrates, Bishop Museum
James Maragos, PhD, Benthic Team – Corals, USFWS
Greta Aeby, PhD, Benthic Team – Corals, Hawaii DLNR-DAR
Edward DeMartini, PhD, Fish Team, NOAA-NMFS
Alan Friedlander, PhD, Fish Team, NOS, Oceanic Institute
Jason Philibotte, Fish Team, Boston University
Brian Zgliczynski, Towboard Team – Fish, NOAA-NMFS
Molly Timmers, Towboard Team – Habitat, UH-JIMAR, PIFSC-CRED
Joseph Laughlin, Towboard Team – Fish, UH-JIMAR, PIFSC-CRED
Jacob Asher, Towboard Team – Habitat, UH-JIMAR, PIFSC-CRED
Jamison Gove, Mooring Team, UH-JIMAR, PIFSC-CRED

Kyle Hogrefe, Mooring Team, UH-JIMAR, PIFSC-CRED
Christina Kistner, Mooring Team, UH-JIMAR, PIFSC-CRED
Jeremey Jones, Mooring Team, UH-JIMAR, PIFSC-CRED
John Rooney, PhD, Habitat Mapping Team – Towed Camera, UH-JIMAR, PIFSC-CRED
Elizabeth Flint, PhD, Terrestrial Team, USFWS
Chris Eggleston, Terrestrial Team, USFWS
June Firing, Data Manager, UH-JIMAR, PIFSC-CRED
Phil White, Senior Survey Tech, NOAA ship *Oscar Elton Sette*

DATA COLLECTED:

Digital images of diseased coral
Field notes on signs of coral bleaching or disease
Samples of diseased coral for histopathological analysis
Digital images from algal photoquadrats
Algal voucher specimens
Algal field notes of species diversity and relative abundance
Acoustic Doppler Current Profile (ADCP) data
Digital images of the benthic habitat from towboard surveys
Macro-Invertebrate counts from towboard surveys
Quantitative surveys of reef fishes (larger than 50 cm TL) to species level from towboards
Habitat lineation from towboard surveys
Benthic composition estimations from towboard surveys
Videos of the seafloor from TOAD operations
QTC (benthic acoustic signature) data
Acoustic doppler current profiler (ADCP) transects
Conductivity, temperature and depth (CTD) profiles to 500 m

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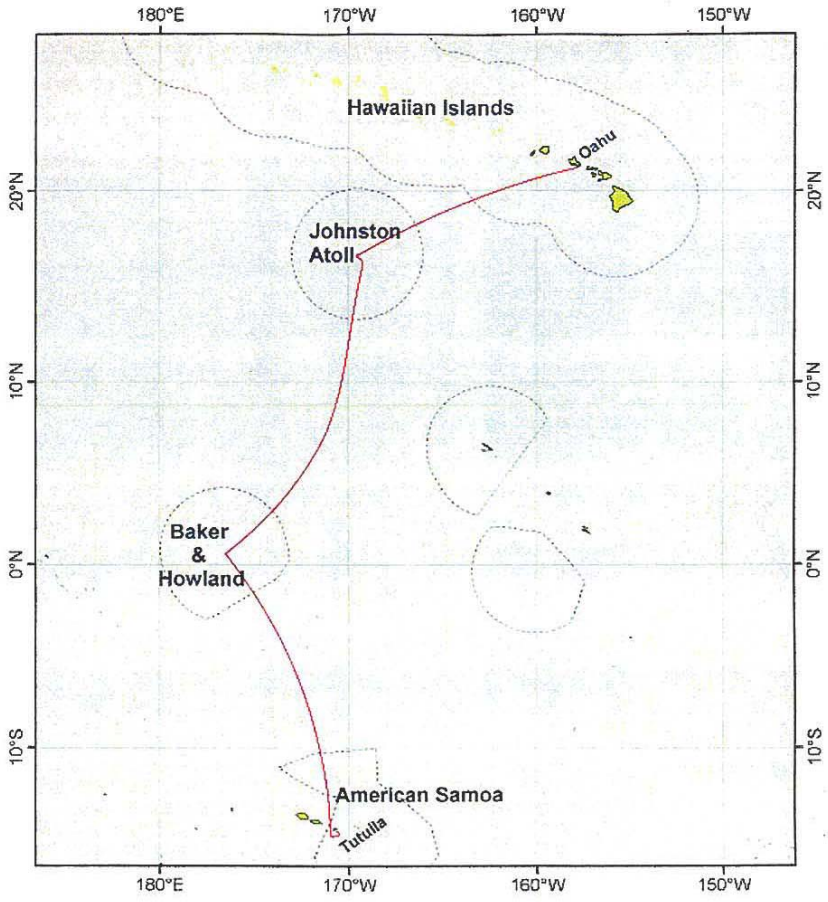

Figure 1.--Track of the Oscar Elton Sette OES-04-01 (OES-10), January 8-29, 2004.